

PARADISE RIVER FOURTH CROSSING BRIDGE
Mount Rainier National Park
Spanning Paradise River on loop road in Paradise Park
Longmire Vicinity
Pierce County
Washington

HAER No. WA-45

HAER
WASH
27-LONG.V
19-

PHOTOGRAPHS

WRITTEN HISTORICAL AND DESCRIPTIVE DATA

HISTORIC AMERICAN ENGINEERING RECORD
PARADISE RIVER FOURTH CROSSING BRIDGE
Mount Rainier National Park
HAER No. WA-45

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I. INTRODUCTION

Location: Spanning Paradise River on loop road in Paradise Park, 1/2 mile northeast of Paradise Inn, Mount Rainier National Park, Pierce County, Washington.
Quad: Mt. Rainier East, Wash.
UTM: 10/597260/5182410

Date of Construction: 1925-27

Structure type: Stone-faced reinforced concrete filled spandrel arch bridge

FHWA Structure No.: 9450-018P

Designer: Nathan W. Morgan, National Park Service Engineering Division, Portland, Oregon

Contractor: Feldschau and Chaffee, Tillamook, Oregon

Engineer: Robert N. Kellogg, National Park Service Engineering Division, Resident Engineer

Owner: Mount Rainier National Park, National Park Service

Use: Park highway bridge

Significance: The Fourth Crossing Bridge typifies the National Park Service's "Rustic Style" of architecture through its use of a native granite veneer to conceal its reinforced concrete construction.

Project Information: Documentation of the Paradise River-Fourth Crossing Bridge is part of the Mount Rainier National Park Roads and Bridges Recording Project, conducted in summer 1992 by the Historic American Engineering Record.

Richard H. Quin, Historian, 1992

II. HISTORY

This is one in a series of reports prepared for the Mount Rainier National Park Roads and Bridges Recording Project. HAER No. WA-35, MOUNT RAINIER NATIONAL PARK ROADS AND BRIDGES, contains an overview history of the park roads. In addition, HAER No. WA-119, NISQUALLY ROAD, contains more specific information on the road on which the structure is located.

Nisqually Road

The "Government Road" or Nisqually Road, built by the U.S. Army Corps of Engineers between 1904 and 1915, was the first road constructed in Mount Rainier National Park. It was designed by Eugene V. Ricksecker, a talented civilian engineer for the Corps' Seattle office, and is remarkable for its sensitive relationship to the magnificent park landscape. The road climbs on a steady grade not exceeding 4 percent from Longmire to Paradise, taking in fabulous vistas and providing access to old-growth forest, waterfalls, a retreating glacier, and finally, the lush subalpine meadows of Paradise Valley. Although reconstructed in the 1920s, the road still follows the original route for most of the distance to Paradise. The road is the principal thoroughfare in Mount Rainier National Park and the only park road maintained for winter travel.

The 18.4-mile Nisqually Road begins at the Nisqually Entrance, seven miles east of Ashford, Washington. It is a continuation into the park of the old "Mountain Highway" from Tacoma, now numbered as State Highway 706 outside the park boundaries. After passing the reconstructed "rustic style" entrance arch and log entrance station, the road continues east through stands of enormous old-growth trees, reaching Longmire at mile six. It stays on the northwest side of the Nisqually River and continues northeast to a crossing of Van Trump Creek at the Christine Falls Bridge [HAER No. WA-48]. From there, the road runs east to cross the Nisqually River at the Glacier Bridge [HAER No. WA-61], then climbs and loops back to the southwest to Ricksecker Point. The main road follows a 1921 cut-off road here; the old road ran around the outer edge of the point. Running generally west again, the Nisqually Road reaches Narada Falls. Here again, the main road now follows the route of another 1921 cut-off road; the old route, which crossed the Paradise River First Crossing Bridge [HAER No. WA-47] and climbed a series of switchbacks to Inspiration Point, has been abandoned. From Narada Falls, the present road loops through the marshy bogs of Frog Heaven and then turns northwest onto a modern (1958) road segment for the final approach to Paradise Valley. The old road is met again near the Paradise Inn, where it runs east and south as a one-way road, crossing the rustic Edith Creek [HAER No. WA-46] and Paradise River Fourth Crossing bridges before dropping to Inspiration Point. For its final segment, the Nisqually Road turns east again to cross the Paradise River Second Crossing Bridge [HAER No. WA-62] and just beyond, a juncture with the old road.

Paradise River Fourth Crossing Bridge

The Fourth Crossing Bridge spans Paradise River near the head of Paradise Valley, less than one mile below the river's source at the Paradise Glacier. The stone-faced reinforced concrete bridge carries the one-way Paradise loop road across the stream a half mile east of the historic Paradise Inn.

The first bridge at the location was built as part of the original construction of the "Government" or Nisqually Road [HAER No. WA-35a]. A 1912 photo in the park archives indicates that this was a simple six-panel Howe truss structure. Unlike most Howe trusses, the wooden deck was carried across

at the center of the panels, that is, in line with the crossing of the diagonals.¹

The present bridge was constructed in 1925 and 1926 by the Tillamook, Oregon firm of Feldschau and Chaffee as part of a combined contract with four other bridges which crossed Edith Creek, Van Trump Creek at Christine Falls, Kautz Creek and Tahoma Creek, and Paradise River on the Narada Cut-Off road (Second Crossing). The bridge was designed by the Portland, Oregon-based National Park Service Engineering Division but was constructed under the supervision of the Bureau of Public Roads.

The structure is basically identical to the Edith Creek Bridge a quarter-mile northwest on the loop road. The two structures are short arched bridges of reinforced concrete construction with masonry spandrel and wing walls and stone guard rails. This use of stone veneer is typical of the National Park Service's so-called "rustic style" of architecture which dictated that park structures and facilities harmonize with their settings. The granite facing of the bridge works particularly well in the rugged mountain environment.

A detour bridge at the site was erected in August 1925. Structural work began late in the month with the excavation for the abutments. This was completed by the second week of September, and cement, reinforcing steel and coarse aggregate for the concrete were stockpiled at the site. Concrete for the two abutments was poured the third week, and forms for the arch ring and spandrel walls were erected the fourth week. By the end of the month, the reinforcing steel had been placed, and the concrete was poured for the arch. Cold weather set in just as the arch ring was poured, and it was necessary to cover the bridge with canvas and keep fires burning around the structure for 72 hours to prevent possible freezing.²

The spandrel wall forms were finished by 10 October and concrete was poured in the walls four days later. Placing of the backfill followed and by the 23rd of the month was complete to the top of the counterfort walls. Following a week of curing, the fill was then placed over the arch. The engineer indicated that, as the concrete was well set, no harm should come from loading in this manner.³

All work at the site had to be suspended on 16 November because of winter weather. The concrete work was largely finished, and the placing of masonry was 75 percent complete. However, backfilling and the construction of masonry guard rails and wing walls remained to be done, along with the removal of the timber forms and general clean-up work.⁴

Work resumed early in 1926. Hand-placed rip-rap was placed at the upstream bases of the abutments. An existing dry-laid guard wall extending along the road was altered to connect with the new wing walls. In February 1926, Bert H. Burrell, Acting Chief Civil Engineer for the National Park Service, instructed the resident engineer to order the contractor to remove some five square yards of small stone facing already installed on the spandrel walls and replace it with larger sized stone. This work was to be done by the contractor at no additional cost to the government.⁵

Although most work had been completed, the contractor troubled the park administration with a series of delays, doing little work on the bridge in the 1926 season. Most of the contractor's work that year focused on the construction of the Tahoma and Kautz Creek bridges west of Longmire. The Fourth Crossing Bridge was not completed until spring 1927. On 12 March, National Park Service Acting Director A. E. Demaray recommended to the Secretary of the Interior that the bridge be accepted.⁶

Description

The single-span structure is of reinforced concrete construction, faced with native stone veneer. The earth-filled spandrel arch rib structure is 32' in length and 25' wide (out-to-out). Internal concrete cross beams strengthen the arch and spandrel walls. The deck bears two 10' lanes. The bridge stands 15' 6" above the water (upstream side); vertical clearance below the center of the arch is 10'. Stone masonry guard walls, 3' 6" in height and 2' thick, are located on each side. No sidewalk is provided. Stepped wing walls at each end are canted at a 45° angle, except for the northeast abutment, which curves backward. A clear break is apparent at the line between the spandrel walls and wing walls, and the wings are constructed of larger stones (up to 2' in dimension.) The roadway and guard walls are built on camber of 1" per foot.

The single span arch springs from stub abutments on solid rock skew back foundations. The bridge is surfaced with asphalt pavement over the granular fill material. The structure was designed for a snow load (dead load) of 500 pounds per square foot and a live load able to carry a twenty-ton steam shovel.

The Fourth Crossing Bridge is located in the lower subalpine zone. Subalpine firs are located in clumps around the bridge, growing to taller sizes where protected from the wind. At the time of the HAER inspection in early July, the alpine flowers were coming into bloom around the site; these included lupines, asters, mountain anemones, and Indian Paintbrush.

III. ENDNOTES

1. "Bridge Over Government Road, Rainier National Park," photograph, MORA Archives, Historic photos collection, Bridges and Related Structures file, Entry No. 22.
2. R. N. Kellogg, Associate Engineer, National Park Service, "General Report on the Status of Work on Nisqually Bridges," 13 February 1926, 3. National Archives, RG 79, Entry 22 Box 16 Special Reports; O. A. Tomlinson, Superintendent, Mount Rainier National Park, Superintendent's Monthly Report, September 1925, 5. MORA Archives, Box H2615, Superintendents' Monthly Reports 1924-1927 file.
3. Kellogg, "General Report," 4; Kellogg to Bert H. Burrell, Acting Chief Civil Engineer, National Park Service Engineering Division, Portland, OR, 23 October 1925. National Archives, RG 79 Entry 22 Box 18.
4. Tomlinson, Superintendent's Monthly Report, November 1925, 5. MORA Archives, Box H2615, Superintendents' Monthly Reports 1924-1927 file; Kellogg, "General Report," 4.
5. Bert H. Burrell, Acting Chief Civil Engineer, National Park Service Engineering Division, Portland, OR, to C. H. Purcell, District Engineer, Bureau of Public Roads, Portland, OR, 27 February 1926; R. B. Tipton, Senior Highway Draftsman, Bureau of Public Roads, "Report on Nisqually Bridges, Rainier National Park," 24 August 1926. National Archives, RG 70 Entry 22 Box 18.
6. A. E. Demaray, Acting Director, National Park Service, to Secretary of the Interior, 12 March 1927. National Archives, RG 79 Box 1991 File 12/7.

IV. BIBLIOGRAPHY

"Bridge Over Government Road, Rainier National Park." Photograph. MORA Archives, Historic photos collection, Bridges and Related Structures file, Entry No. 22.

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Demaray, A. E., Acting Director, National Park Service, to Secretary of the Interior, 12 March 1927. National Archives, RG 79 Box 1991 File 12/7.

Kellogg, Robert N., Associate Engineer, National Park Service. "General Report on the Status of Work on Nisqually Bridges," 13 February 1926. National Archives, RG 79 Entry 22 Box 16, Special Reports.

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Tipton, R. B., Senior Highway Draftsman, Bureau of Public Roads. "Report on Nisqually Bridges, Rainier National Park," 24 August 1926. National Archives, RG 70 Entry 22 Box 18.

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--Superintendent's Monthly Report, November 1925. MORA Archives, Box H2615, Superintendents' Monthly Reports 1924-1927 file.

U.S. Department of the Interior, National Park Service, Engineering Division. "Fourth Paradise Crossing, Nisqually Road." Construction drawing No. 306, 10 August 1925.

--Construction drawing No. 257, Landscape details, 29 July 1925.

U.S. Department of Transportation, Federal Highway Administration Region 8, Office of Western Bridge Design. Bridge Safety Inspection Report: Paradise Creek--4th Crossing, Mt. Rainier N.P., Structure No. 9450-018P. Denver, CO: Federal Highway Administration, September 1975.

ADDENDUM TO
PARADISE RIVER FOURTH CROSSING BRIDGE
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